

WHAT IS CLAIMED IS:

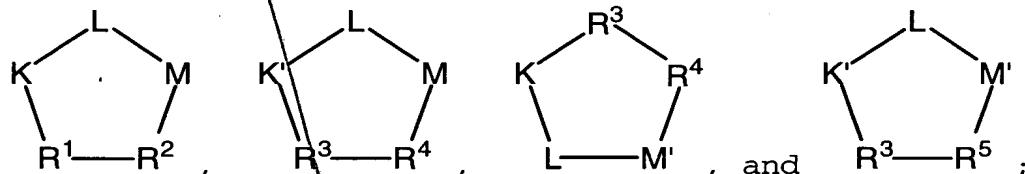
1. A compound, comprising: a targeting moiety and a chelator, wherein the targeting moiety is bound to the chelator, is a peptide or peptidomimetic, and binds to a receptor that is upregulated during angiogenesis and the compound has 0-1 linking groups between the targeting moiety and chelator.

10 2. A compound according to Claim 1, wherein the targeting moiety is a peptide or a mimetic thereof and the receptor is selected from the group: EGFR, FGFR, PDGFR, Flk-1/KDR, Flt-1, Tek, Tie, neuropilin-1, endoglin, endosialin, Axl, $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_5\beta_1$, $\alpha_4\beta_1$, $\alpha_1\beta_1$, and $\alpha_2\beta_2$ and the linking group is present between the targeting moiety and chelator.

20 3. A compound according to Claim 2, the receptor is the integrin $\alpha_v\beta_3$ and the compound is of the formula:

(Q)_d-L_n-Ch or (Q)_d-L_n-(Ch)_d

wherein, Q is a peptide independently selected from the group:



25 K is an L-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine, δ -N-2-imidazolinylornithine, δ -N-benzylcarbamoylornithine, and β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

30 K' is a D-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine,

δ -N-2-imidazolinylornithine,
 δ -N-benzylcarbamoylornithine, and
 β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

5 L is independently selected at each occurrence from the group:
glycine, L-alanine, and D-alanine;

M is L-aspartic acid;

10 M' is D-aspartic acid;

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R¹ is an amino acid substituted with 0-1 bonds to L_n,
independently selected at each occurrence from the group:
glycine, L-valine, D-valine, alanine, leucine,
isoleucine, norleucine, 2-aminobutyric acid,
2-aminohexanoic acid, tyrosine, phenylalanine,
thienylalanine, phenylglycine, cyclohexylalanine,
homophenylalanine, 1-naphthylalanine, lysine, serine,
ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic
acid, cysteine, penicillamine, and methionine;

20 R² is an amino acid, substituted with 0-1 bonds to L_n,
independently selected at each occurrence from the group:
glycine, valine, alanine, leucine, isoleucine,
25 norleucine, 2-aminobutyric acid, 2-aminohexanoic acid,
tyrosine, L-phenylalanine, D-phenylalanine,
thienylalanine, phenylglycine, biphenylglycine,
cyclohexylalanine, homophenylalanine,
L-1-naphthylalanine, D-1-naphthylalanine, lysine, serine,
30 ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic
acid, cysteine, penicillamine, methionine, and
2-aminothiazole-4-acetic acid;

35 R³ is an amino acid, substituted with 0-1 bonds to L_n,
independently selected at each occurrence from the group:
glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
acid, D-tyrosine, D-phenylalanine, D-thienylalanine,

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D-phenylglycine, D-cyclohexylalanine,
D-homophenylalanine, D-1-naphthylalanine, D-lysine,
D-serine, D-ornithine, D-1,2-diaminobutyric acid,
D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
and D-methionine;

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R⁴ is an amino acid, substituted with 0-1 bonds to L_n,
independently selected at each occurrence from the group:
glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
acid, D-tyrosine, D-phenylalanine, D-thienylalanine,
D-phenylglycine, D-cyclohexylalanine,
D-homophenylalanine, D-1-naphthylalanine, D-lysine,
D-serine, D-ornithine, D-1,2-diaminobutyric acid,
D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
D-methionine, and 2-aminothiazole-4-acetic acid;

20

R⁵ is an amino acid, substituted with 0-1 bonds to L_n,
independently selected at each occurrence from the group:
glycine, L-valine, L-alanine, L-leucine, L-isoleucine,
L-norleucine, L-2-aminobutyric acid, L-2-aminohexanoic
acid, L-tyrosine, L-phenylalanine, L-thienylalanine,
L-phenylglycine, L-cyclohexylalanine,
L-homophenylalanine, L-1-naphthylalanine, L-lysine,
L-serine, L-ornithine, L-1,2-diaminobutyric acid,
L-1,2-diaminopropionic acid, L-cysteine, L-penicillamine,
L-methionine, and 2-aminothiazole-4-acetic acid;

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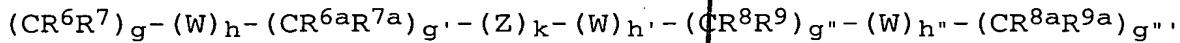
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provided that one of R¹, R², R³, R⁴, and R⁵ in each Q is
substituted with a bond to L_n, further provided that when
R² is 2-aminothiazole-4-acetic acid, K is
N-methylarginine, further provided that when R⁴ is
2-aminothiazole-4-acetic acid, K and K' are
N-methylarginine, and still further provided that when R⁵
is 2-aminothiazole-4-acetic acid, K' is N-methylarginine;

d is selected from 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

L_n is a linking group having the formula:



5 provided that g+h+g'+k+h'+g''+h''+g''' is other than 0;

W is independently selected at each occurrence from the group:

O, S, NH, NHC(=O), C(=O)NH, C(=O), C(=O)O, OC(=O),

NHC(=S)NH, NHC(=O)NH, SO₂, (OCH₂CH₂)_s, (CH₂CH₂O)_{s'},

10 (OCH₂CH₂CH₂)_{s''}, (CH₂CH₂CH₂O)_t, and (aa)_{t'};

aa is independently at each occurrence an amino acid;

15 Z is selected from the group: aryl substituted with 0-3 R¹⁰,
C₃-10 cycloalkyl substituted with 0-3 R¹⁰, and a 5-10
membered heterocyclic ring system containing 1-4
heteroatoms independently selected from N, S, and O and
substituted with 0-3 R¹⁰;

20 R⁶, R^{6a}, R⁷, R^{7a}, R⁸, R^{8a}, R⁹ and R^{9a} are independently selected
at each occurrence from the group: H, =O, COOH, SO₃H,
PO₃H, C₁-C₅ alkyl substituted with 0-3 R¹⁰, aryl
substituted with 0-3 R¹⁰, benzyl substituted with 0-3
R¹⁰, and C₁-C₅ alkoxy substituted with 0-3 R¹⁰,
25 NHC(=O)R¹¹, C(=O)NHR¹¹, NHC(=O)NHR¹¹, NHR¹¹, R¹¹, and a
bond to Ch;

30 R¹⁰ is independently selected at each occurrence from the
group: a bond to Ch, COOR¹¹, OH, NHR¹¹, SO₃H, PO₃H, aryl
substituted with 0-3 R¹¹, C₁-5 alkyl substituted with 0-1
R¹², C₁-5 alkoxy substituted with 0-1 R¹², and a 5-10
membered heterocyclic ring system containing 1-4
heteroatoms independently selected from N, S, and O and
substituted with 0-3 R¹¹;

35 R¹¹ is independently selected at each occurrence from the
group: H, aryl substituted with 0-1 R¹², a 5-10 membered
heterocyclic ring system containing 1-4 heteroatoms

independently selected from N, S, and O and substituted with 0-1 R¹², C₃₋₁₀ cycloalkyl substituted with 0-1 R¹², polyalkylene glycol substituted with 0-1 R¹², carbohydrate substituted with 0-1 R¹², cyclodextrin substituted with 0-1 R¹², amino acid substituted with 0-1 R¹², polycarboxyalkyl substituted with 0-1 R¹², polyazaalkyl substituted with 0-1 R¹², peptide substituted with 0-1 R¹², wherein the peptide is comprised of 2-10 amino acids, and a bond to C_h;

10 R¹² is a bond to C_h;

15 k is selected from 0, 1, and 2;

h is selected from 0, 1, and 2;

20 h' is selected from 0, 1, 2, 3, 4, and 5;

h'' is selected from 0, 1, 2, 3, 4, and 5;

g is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

g' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

g'' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

25 g''' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

s is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

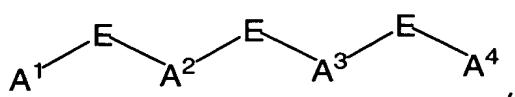
s' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

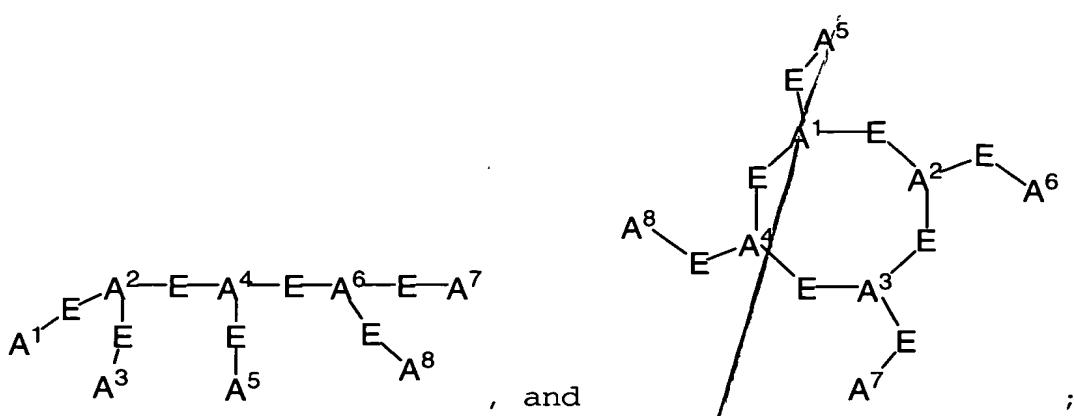
s'' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

t is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

25 t' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

C_h is a metal bonding unit having a formula selected from the group:





5 $A^1, A^2, A^3, A^4, A^5, A^6, A^7$, and A^8 are independently selected at each occurrence from the group $N, NR^{13}, NR^{13}R^{14}, S, SH, S(Pg), O, OH, PR^{13}, PR^{13}R^{14}, P(O)R^{15}R^{16}$, and a bond to L_n ;

10 E is a bond, CH , or a spacer group independently selected at each occurrence from the group: C_1-C_{10} alkyl substituted with 0-3 R^{17} , aryl substituted with 0-3 R^{17} , C_{3-10} cycloalkyl substituted with 0-3 R^{17} , heterocyclo- C_{1-10} alkyl substituted with 0-3 R^{17} , wherein the heterocyclo group is a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S , and O , C_{6-10} aryl- C_{1-10} alkyl substituted with 0-3 R^{17} , C_{1-10} alkyl- C_{6-10} aryl- substituted with 0-3 R^{17} , and a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S , and O and substituted with 0-3 R^{17} .

15 R^{13} , and R^{14} are each independently selected from the group: a bond to L_n , hydrogen, C_1-C_{10} alkyl substituted with 0-3 R^{17} , aryl substituted with 0-3 R^{17} , C_{1-10} cycloalkyl substituted with 0-3 R^{17} , heterocyclo- C_{1-10} alkyl substituted with 0-3 R^{17} , wherein the heterocyclo group is a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S , and O , C_{6-10} aryl- C_{1-10} alkyl substituted with 0-3 R^{17} , C_{1-10} alkyl- C_{6-10} aryl- substituted with 0-3 R^{17} , a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S , and O and

substituted with 0-3 R¹⁷, and an electron, provided that when one of R¹³ or R¹⁴ is an electron, then the other is also an electron;

5 alternatively, R¹³ and R¹⁴ combine to form =C(R²⁰)(R²¹);

R¹⁵ and R¹⁶ are each independently selected from the group: a bond to L_n, -OH, C₁-C₁₀ alkyl substituted with 0-3 R¹⁷, C₁-C₁₀ alkyl substituted with 0-3 R¹⁷, aryl substituted with 0-3 R¹⁷, C₃-C₁₀ cycloalkyl substituted with 0-3 R¹⁷, wherein the heterocyclo group is a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O, C₆-C₁₀ aryl-C₁-C₁₀ alkyl substituted with 0-3 R¹⁷, C₁-C₁₀ alkyl-C₆-C₁₀ aryl-substituted with 0-3 R¹⁷, and a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-3 R¹⁷;

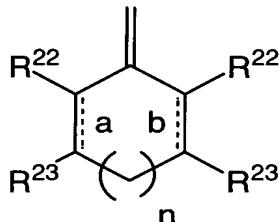
R¹⁷ is independently selected at each occurrence from the group: a bond to L_n, =O, F, Cl, Br, I, -CF₃, -CN, -CO₂R¹⁸, -C(=O)R¹⁸, -C(=O)N(R¹⁸)₂, -CHO, -CH₂OR¹⁸, -OC(=O)R¹⁸, -OC(=O)OR^{18a}, -OR¹⁸, -OC(=O)N(R¹⁸)₂, -NR¹⁹C(=O)R¹⁸, -NR¹⁹C(=O)OR^{18a}, -NR¹⁹C(=O)N(R¹⁸)₂, -NR¹⁹SO₂N(R¹⁸)₂, -NR¹⁹SO₂R^{18a}, -SO₃H, -SO₂R^{18a}, -SR¹⁸, -S(=O)R^{18a}, -SO₂N(R¹⁸)₂, -N(R¹⁸)₂, -NHC(=S)NHR¹⁸, =NOR¹⁸, NO₂, -C(=O)NHOR¹⁸, -C(=O)NHNHR¹⁸R^{18a}, -OCH₂CO₂H, 2-(1-morpholino)ethoxy, C₁-C₅ alkyl, C₂-C₄ alkenyl, C₃-C₆ cycloalkyl, C₃-C₆ cycloalkylmethyl, C₂-C₆ alkoxyalkyl, aryl substituted with 0-2 R¹⁸, and a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O;

R¹⁸, R^{18a}, and R¹⁹ are independently selected at each occurrence from the group: a bond to L_n, H, C₁-C₆ alkyl, phenyl, benzyl, C₁-C₆ alkoxy, halide, nitro, cyano, and trifluoromethyl;

Pg is a thiol protecting group;

R²⁰ and R²¹ are independently selected from the group: H,
5 C₁-C₁₀ alkyl, -CN, -CO₂R²⁵, -C(=O)R²⁵, -C(=O)N(R²⁵)₂,
C₂-C₁₀ 1-alkene substituted with 0-3 R²³, C₂-C₁₀ 1-alkyne
substituted with 0-3 R²³, aryl substituted with 0-3 R²³,
unsaturated 5-10 membered heterocyclic ring system
containing 1-4 heteroatoms independently selected from N,
10 S, and O and substituted with 0-3 R²³, and unsaturated
C₃-10 carbocycle substituted with 0-3 R²³;

alternatively, R²⁰ and R²¹, taken together with the divalent
carbon radical to which they are attached form:



R²² and R²³ are independently selected from the group: H, R²⁴,
C₁-C₁₀ alkyl substituted with 0-3 R²⁴, C₂-C₁₀ alkenyl
substituted with 0-3 R²⁴, C₂-C₁₀ alkynyl substituted with
0-3 R²⁴, aryl substituted with 0-3 R²⁴, a 5-10 membered
20 heterocyclic ring system containing 1-4 heteroatoms
independently selected from N, S, and O and substituted
with 0-3 R²⁴, and C₃-10 carbocycle substituted with 0-3
R²⁴;

25 alternatively, R²², R²³ taken together form a fused aromatic
or a 5-10 membered heterocyclic ring system containing
1-4 heteroatoms independently selected from N, S, and O;

30 **a** and **b** indicate the positions of optional double bonds and **n**
is 0 or 1;

5 R²⁴ is independently selected at each occurrence from the group: =O, F, Cl, Br, I, -CF₃, -CN, -CO₂R²⁵, -C(=O)R²⁵, -C(=O)N(R²⁵)₂, -N(R²⁵)₃⁺, -CH₂OR²⁵, -OC(=O)R²⁵, -OC(=O)OR^{25a}, -OR²⁵, -OC(=O)N(R²⁵)₂, -NR²⁶C(=O)R²⁵, -NR²⁶C(=O)OR^{25a}, -NR²⁶C(=O)N(R²⁵)₂, -NR²⁶SO₂N(R²⁵)₂, -NR²⁶SO₂R^{25a}, -SO₃H, -SO₂R^{25a}, -SR²⁵, -S(=O)R^{25a}, -SO₂N(R²⁵)₂, -N(R²⁵)₂, =NOR²⁵, -C(=O)NHOR²⁵, -OCH₂CO₂H, and 2-(1-morpholino)ethoxy; and,

10 R²⁵, R^{25a}, and R²⁶ are each independently selected at each occurrence from the group: hydrogen and C₁-C₆ alkyl; and a pharmaceutically acceptable salt thereof.

15 L is glycine;

20 R¹ is an amino acid, optionally substituted with a bond to L_n, independently selected at each occurrence from the group: L-valine, D-valine, alanine, leucine, isoleucine, norleucine, 2-aminobutyric acid, tyrosine, phenylalanine, 25 phenylglycine, cyclohexylalanine, homophenylalanine, lysine, ornithine, 1,2-diaminobutyric acid, and 1,2-diaminopropionic acid;

30 R² is an amino acid, optionally substituted with a bond to L_n, independently selected at each occurrence from the group: valine, alanine, leucine, isoleucine, norleucine, 2-aminobutyric acid, tyrosine, L-phenylalanine, D-phenylalanine, thienylalanine, phenylglycine, biphenylglycine, cyclohexylalanine, homophenylalanine, 35 L-1-naphthylalanine, D-1-naphthylalanine, lysine, ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic acid, and 2-aminothiazole-4-acetic acid;

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R³ is an amino acid, optionally substituted with a bond to L_n, independently selected at each occurrence from the group: D-valine, D-alanine, D-leucine, D-isoleucine, D-norleucine, D-2-aminobutyric acid, D-tyrosine, 5 D-phenylalanine, D-phenylglycine, D-cyclohexylalanine, D-homophenylalanine, D-lysine, D-serine, D-ornithine, D-1,2-diaminobutyric acid, and D-1,2-diaminopropionic acid;

10 R⁴ is an amino acid, optionally substituted with a bond to L_n, independently selected at each occurrence from the group: D-valine, D-alanine, D-leucine, D-isoleucine, D-norleucine, D-2-aminobutyric acid, D-tyrosine, D-phenylalanine, D-thienylalanine, D-phenylglycine, 15 D-cyclohexylalanine, D-homophenylalanine, D-1-naphthylalanine, D-lysine, D-ornithine, D-1,2-diaminobutyric acid, D-1,2-diaminopropionic acid, and 2-aminothiazole-4-acetic acid;

20 R⁵ is an amino acid, optionally substituted with a bond to L_n, independently selected at each occurrence from the group: L-valine, L-alanine, L-leucine, L-isoleucine, L-norleucine, L-2-aminobutyric acid, L-tyrosine, L-phenylalanine, L-thienylalanine, L-phenylglycine, 25 L-cyclohexylalanine, L-homophenylalanine, L-1-naphthylalanine, L-lysine, L-ornithine, L-1,2-diaminobutyric acid, L-1,2-diaminopropionic acid, and 2-aminothiazole-4-acetic acid;

30 d is selected from 1, 2, and 3;

W is independently selected at each occurrence from the group: O, NH, NHC(=O), C(=O)NH, C(=O), C(=O)O, OC(=O), NHC(=S)NH, NHC(=O)NH, SO₂, (OCH₂CH₂)_s, (CH₂CH₂O)_{s'}, 35 (OCH₂CH₂CH₂)_{s''}, and (CH₂CH₂CH₂O)_t,

Z is selected from the group: aryl substituted with 0-1 R¹⁰, C₃₋₁₀ cycloalkyl substituted with 0-1 R¹⁰, and a 5-10

membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-1 R¹⁰;

5 R⁶, R^{6a}, R⁷, R^{7a}, R⁸, R^{8a}, R⁹, and R^{9a} are independently selected at each occurrence from the group: H, =O, COOH, SO₃H, C₁-C₅ alkyl substituted with 0-1 R¹⁰, aryl substituted with 0-1 R¹⁰, benzyl substituted with 0-1 R¹⁰, and C₁-C₅ alkoxy substituted with 0-1 R¹⁰,

10 NHC(=O)R¹¹, C(=O)NHR¹¹, NHC(=O)NHR¹¹, NHR¹¹, R¹¹, and a bond to Ch;

15 R¹⁰ is independently selected at each occurrence from the group: COOR¹¹, OH, NHR¹¹, SO₃H, aryl substituted with 0-1 R¹¹, a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-1 R¹¹, C₁-C₅ alkyl substituted with 0-1 R¹², C₁-C₅ alkoxy substituted with 0-1 R¹², and a bond to Ch;

20 R¹¹ is independently selected at each occurrence from the group: H, aryl substituted with 0-1 R¹², a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-1 R¹², polyalkylene glycol substituted with 0-1 R¹², carbohydrate substituted with 0-1 R¹², cyclodextrin substituted with 0-1 R¹², amino acid substituted with 0-1 R¹², and a bond to Ch;

30 k is 0 or 1;
h is 0 or 1;
h' is 0 or 1;
s is selected from 0, 1, 2, 3, 4, and 5;
s' is selected from 0, 1, 2, 3, 4, and 5;
35 s" is selected from 0, 1, 2, 3, 4, and 5;
t is selected from 0, 1, 2, 3, 4, and 5;

$A^1, A^2, A^3, A^4, A^5, A^6, A^7$, and A^8 are independently selected at each occurrence from the group: NR^{13} , $NR^{13}R^{14}$, S , SH , $S(Pg)$, OH , and a bond to L_n ;

5 E is a bond, CH, or a spacer group independently selected at
each occurrence from the group: C₁-C₁₀ alkyl substituted
with 0-3 R¹⁷, aryl substituted with 0-3 R¹⁷, C₃₋₁₀
cycloalkyl substituted with 0-3 R¹⁷, and a 5-10 membered
heterocyclic ring system containing 1-4 heteroatoms
10 independently selected from N, S, and O and substituted
with 0-3 R¹⁷;

R^{13} , and R^{14} are each independently selected from the group: a bond to L_n , hydrogen, C1-C10 alkyl substituted with 0-3 R^{17} , aryl substituted with 0-3 R^{17} , a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-3 R^{17} , and an electron, provided that when one of R^{13} or R^{14} is an electron, then the other is also an electron;

alternatively, R^{13} and R^{14} combine to form $=C(R^{20})(R^{21})$;

25 R¹⁷ is independently selected at each occurrence from the group: a bond to L_n, =O, F, Cl, Br, I, -CF₃, -CN, -CO₂R¹⁸, -C(=O)R¹⁸, -C(=O)N(R¹⁸)₂, -CH₂OR¹⁸, -OC(=O)R¹⁸, -OC(=O)OR^{18a}, -OR¹⁸, -OC(=O)N(R¹⁸)₂, -NR¹⁹C(=O)R¹⁸, -NR¹⁹C(=O)OR^{18a}, -NR¹⁹C(=O)N(R¹⁸)₂, -NR¹⁹SO₂N(R¹⁸)₂, -NR¹⁹SO₂R^{18a}, -SO₃H, -SO₂R^{18a}, -S(=O)R^{18a}, -SO₂N(R¹⁸)₂, -N(R¹⁸)₂, -NHC(=S)NHR¹⁸, =NOR¹⁸, -C(=O)NHNR¹⁸R^{18a}, -OCH₂CO₂H, and 2-(1-morpholino)ethoxy;

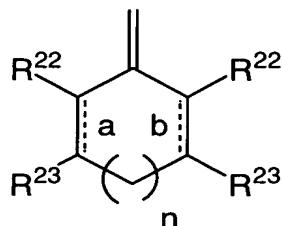
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R¹⁸, R^{18a}, and R¹⁹ are independently selected at each occurrence from the group: a bond to L_n, H, and C₁-C₆ alkyl;

R^{20} and R^{21} are independently selected from the group: H, C₁-C₅ alkyl, -CO₂R²⁵, C₂-C₅ 1-alkene substituted with 0-3

R²³, C₂-C₅ 1-alkyne substituted with 0-3 R²³, aryl substituted with 0-3 R²³, and unsaturated 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-3 R²³;

alternatively, R²⁰ and R²¹, taken together with the divalent carbon radical to which they are attached form:



R²² and R²³ are independently selected from the group: H, and R²⁴;

alternatively, R²², R²³ taken together form a fused aromatic or a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O;

R²⁴ is independently selected at each occurrence from the group: -CO₂R²⁵, -C(=O)N(R²⁵)₂, -CH₂OR²⁵, -OC(=O)R²⁵, -OR²⁵, -SO₃H, -N(R²⁵)₂, and -OCH₂CO₂H; and,

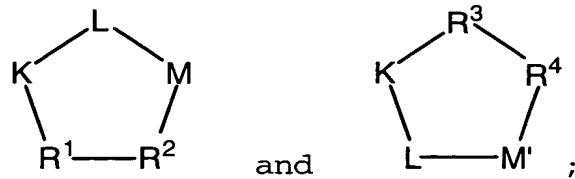
R²⁵ is independently selected at each occurrence from the group: H and C₁-C₃ alkyl.

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5. A compound according to Claim 4, the present invention provides a compound, wherein:

Q is a peptide selected from the group:

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R^1 is L-valine, D-valine, D-lysine optionally substituted on the ϵ amino group with a bond to L_n or L-lysine

5 optionally substituted on the ϵ amino group with a bond to L_n ;

R^2 is L-phenylalanine, D-phenylalanine, D-1-naphthylalanine, 2-aminothiazole-4-acetic acid, L-lysine optionally

10 substituted on the ϵ amino group with a bond to L_n or tyrosine, the tyrosine optionally substituted on the hydroxy group with a bond to L_n ;

R^3 is D-valine, D-phenylalanine, or L-lysine optionally

15 substituted on the ϵ amino group with a bond to L_n ;

R^4 is D-phenylalanine, D-tyrosine substituted on the hydroxy group with a bond to L_n , or L-lysine optionally

substituted on the ϵ amino group with a bond to L_n ;

20 provided that one of R^1 and R^2 in each Q is substituted with a bond to L_n , and further provided that when R^2 is 2-aminothiazole-4-acetic acid, K is N-methylarginine;

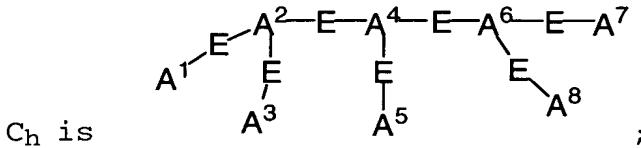
25 d is 1 or 2;

W is independently selected at each occurrence from the group: $NHC(=O)$, $C(=O)NH$, $C(=O)$, $(CH_2CH_2O)_s$, and $(CH_2CH_2CH_2O)_t$;

30 R^6 , R^{6a} , R^7 , R^{7a} , R^8 , R^{8a} , R^9 , and R^{9a} are independently selected at each occurrence from the group: H, $NHC(=O)R^{11}$, and a bond to C_h ;

k is 0;

h" is selected from 0, 1, 2, and 3;
g is selected from 0, 1, 2, 3, 4, and 5;
g' is selected from 0, 1, 2, 3, 4, and 5;
g" is selected from 0, 1, 2, 3, 4, and 5;
5 g''' is selected from 0, 1, 2, 3, 4, and 5;
s' is 1 or 2;
t is 1 or 2;



10

A¹ is selected from the group: OH, and a bond to L_n;

A², A⁴, and A⁶ are each N;

15 A³, A⁵, and A⁸ are each OH;

A⁷ is a bond to L_n or NH-bond to L_n;

E is a C₂ alkyl substituted with 0-1 R¹⁷;

20

R¹⁷ is =O;

alternatively, Ch is A¹' E-A² ;

25 A¹ is NH₂ or N=C(R²⁰)(R²¹);

E is a bond;

A² is NHR¹³;

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R¹³ is a heterocycle substituted with R¹⁷, the heterocycle
being selected from pyridine and pyrimidine;

R¹⁷ is selected from a bond to L_n, C(=O)NHR¹⁸, and C(=O)R¹⁸;

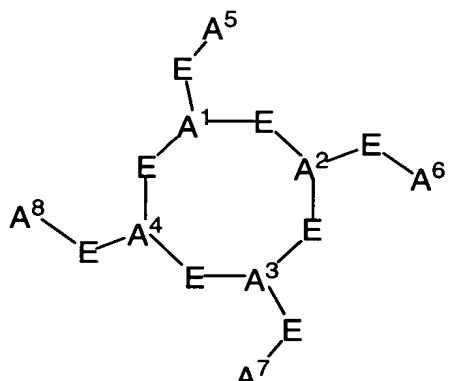
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R¹⁸ is a bond to L_n;

R^{24} is selected from the group: $-CO_2R^{25}$, $-OR^{25}$, $-SO_3H$, and $-N(R^{25})_2$;

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R^{25} is independently selected at each occurrence from the group: hydrogen and methyl;



alternatively, C_h is

;

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A^1 , A^2 , A^3 , and A^4 are each N ;

A^5 , A^6 , and A^8 are each OH;

15 A⁷ is a bond to L_n;

E is a C₂ alkyl substituted with 0-1 R¹⁷; and,

R^{17} is =0.

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6. A compound according to Claim 3, the present invention provides a compound selected from the group:

25 (a) cyclo{Arg-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl]-benzenesulfonic acid)-3-aminopropyl)-Val};

(b) cyclo{Arg-Gly-Asp-D-Tyr.(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl]-benzenesulfonic acid)-18-

amino-14-aza-4,7,10-oxy-15-oxo-octadecoyl)-3-aminopropyl)-Val};

5 (c) [2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-
benzenesulfonic acid]-Glu(cyclo{D-Tyr(3-aminopropyl)-Val-
Arg-Gly-Asp})-cyclo{D-Tyr(3-aminopropyl)-Val-Arg-Gly-
Asp};

10 (d) cyclo(Arg-Gly-Asp-D-Tyr-Lys([2-[[5-[carbonyl]-2-
pyridinyl]hydrazone]methyl]-benzenesulfonic acid));

15 (e) cyclo{Arg-Gly-Asp-D-Phe-Lys([2-[[5-[carbonyl]-2-
pyridinyl]hydrazone]methyl]-benzenesulfonic acid)};

20 (f) [2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-
benzenesulfonic acid]-Glu(cyclo{Lys-Arg-Gly-Asp-D-Phe})-
cyclo{Lys-Arg-Gly-Asp-D-Phe};

25 (g) [2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-
benzenesulfonic acid]-Phe-Glu(cyclo{Lys-Arg-Gly-Asp-D-
Phe})-cyclo{Lys-Arg-Gly-Asp-D-Phe};

30 (h) cyclo{Arg-Gly-Asp-D-Nal-Lys([2-[[5-[carbonyl]-2-
pyridinyl]hydrazone]methyl]-benzenesulfonic acid)};

35 (i) [2-[[5-[carbonyl]-2-pyridinyl]-hydrazone]methyl]-
benzenesulfonic acid]-Glu(cyclo{Lys-Arg-Gly-Asp-D-Nal})-
cyclo{Lys-Arg-Gly-Asp-D-Nal};

(j) cyclo{Arg-Gly-Asp-Lys([2-[[5-[carbonyl]-2-
pyridinyl]hydrazone]methyl]-benzenesulfonic acid)}-D-Val};
;

(k) [2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-
benzenesulfonic acid]-Glu(cyclo{Lys-D-Val-Arg-Gly-Asp})-
cyclo{Lys-D-Val-Arg-Gly-Asp};

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(l) {cyclo(Arg-D-Val-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid]-3-aminopropyl)-D-Asp-Gly};

5 (m) cyclo{D-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid])-D-Phe-D-Asp-Gly-Arg};

10 (n) [2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl]-benzenesulfonic acid]-Glu(cyclo{D-Lys-D-Phe-D-Asp-Gly-Arg})-cyclo{D-Lys-D-Phe-D-Asp-Gly-Arg};

15 (o) cyclo{D-Phe-D-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid])-D-Asp-Gly-Arg};

(p) cyclo{N-Me-Arg-Gly-Asp-ATA-D-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid)};

20 (q) cyclo{Cit-Gly-Asp-D-Phe-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid)};

25 (r) 2-(1,4,7,10-tetraaza-4,7,10-tris(carboxymethyl)-1-cyclododecyl)acetyl-Glu(cyclo{Lys-Arg-Gly-Asp-D-Phe})-cyclo{Lys-Arg-Gly-Asp-D-Phe};

(s) cyclo{Arg-Gly-Asp-D-Phe-Lys(DTPA)};

(t) cyclo{Arg-Gly-Asp-D-Phe-Lys}2(DTPA);

30 (u) Cyclo{Arg-Gly-Asp-D-Tyr(N-DTPA-3-aminopropyl)-Val};

(v) cyclo{Orn(d-N-2-Imidazolinyl)-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl)-benzenesulfonic acid]-3-aminopropyl)-Val};

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(w) *cyclo{Lys-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-Val};*

5 (x) *cyclo{Cys(2-aminoethyl)-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-Val};*

(y) *cyclo{HomLys-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-Val};*

(z) *cyclo{Orn(d-N-Benzylcarbamoyl)-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-Val};*

(aa) *cyclo{Dap(b-(2-benzimidazolylacetyl))-Gly-Asp-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-Val};*

20 (bb) *cyclo{Orn(d-N-2-Imidazolinyl)-Gly-Asp-D-Phe-Lys(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid)};*

25 (cc) *cyclo{Orn(d-N-Benzylcarbamoyl)-Gly-Asp-D-Phe-Lys(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid)};*

(dd) *cyclo{Lys-D-Val-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-D-Asp-Gly};*

30 (ee) *cyclo{Orn(d-N-Benzylcarbamoyl)-D-Val-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-3-aminopropyl)-D-Asp-Gly}; and,*

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(ff) cyclo{Orn(d-N-2-Imidazolinyl)-D-Val-D-Tyr(N-[2-[[5-[carbonyl]-2-pyridinyl]hydrazono]methyl]-benzenesulfonic acid]-3-aminopropyl)-D-Asp-Gly};

5 or a pharmaceutically acceptable salt form thereof.

7. A kit comprising a compound of Claim 3, or a pharmaceutically acceptable salt form thereof and a
10 pharmaceutically acceptable carrier.

8. A kit according to Claim 7, wherein the kit further comprises one or more ancillary ligands and a reducing agent.
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9. A kit according to Claim 8, wherein the ancillary ligands are tricine and TPPTS.
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10. A kit according to Claim 9, wherein the reducing agent is tin(II).
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11. A diagnostic or therapeutic metallopharmaceutical composition, comprising: a metal, a chelator capable of chelating the metal and a targeting moiety, wherein the targeting moiety is bound to the chelator, is a peptide or peptidomimetic and binds to a receptor that is upregulated during angiogenesis and the compound has 0-1 linking groups between the targeting moiety and chelator.
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12. A composition according to Claim 11, wherein the metallopharmaceutical is a diagnostic radiopharmaceutical, the metal is a radioisotope selected from the group: ^{99m}Tc , ^{95}Tc , ^{111}In , ^{62}Cu , ^{64}Cu , ^{67}Ga , and ^{68}Ga , the targeting moiety is a peptide or a mimetic thereof and the receptor is selected from
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the group: EGFR, FGFR, PDGFR, Flk-1/KDR, Flt-1, Tek, Tie, neuropilin-1, endoglin, endosialin, Axl, $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_5\beta_1$, $\alpha_4\beta_1$, $\alpha_1\beta_1$, and $\alpha_2\beta_2$ and the linking group is present between the targeting moiety and chelator.

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13. A composition according to Claim 12, wherein the targeting moiety is a cyclic pentapeptide and the receptor is $\alpha_v\beta_3$.

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14. A composition according to Claim 13, wherein the radioisotope is ^{99m}Tc or ^{95}Tc , the radiopharmaceutical further comprises a first ancillary ligand and a second ancillary 15 ligand capable of stabilizing the radiopharmaceutical.

15. A composition according to Claim 14, wherein the radioisotope is ^{99m}Tc .

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16. A composition according to Claim 15, wherein the radiopharmaceutical is selected from the group:

25 ^{99m}Tc (tricine) (TPPTS) (cyclo(Arg-Gly-Asp-D-Tyr(N-[(5-[carbonyl]-2-pyridinyl]diazenido]-3-aminopropyl)-Val));

^{99m}Tc (tricine) (TPPMS) (cyclo(Arg-D-Val-D-Tyr(N-[(5-[carbonyl]-2-pyridinyl]diazenido]-3-aminopropyl)-D-Asp-Gly));

30 ^{99m}Tc (tricine) (TPPDS) (cyclo(Arg-D-Val-D-Tyr(N-[(5-[carbonyl]-2-pyridinyl]diazenido)-3-aminopropyl)-D-Asp-Gly));

35 ^{99m}Tc (tricine) (TPPTS) (cyclo(Arg-D-Val-D-Tyr(N-[(5-[carbonyl]-2-pyridinyl]diazenido)-3-aminopropyl)-D-Asp-Gly));

^{99m}Tc (tricine) (TPPTS) (cyclo(Arg-Gly-Asp-D-Phe-Lys(N-[(5-[carbonyl]-2-pyridinyl]diazenido))));

^{99m}Tc (tricine) (TPPTS) (cyclo(Arg-Gly-Asp-D-Tyr-Lys(N-[5-[carbonyl]-2-pyridinyl]diazenido)));

5 ^{99m}Tc (tricine) (TPPTS) ([2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-Phe-Glu(cyclo{Lys-Arg-Gly-Asp-D-Phe})-cyclo{Lys-Arg-Gly-Asp-D-Phe});

10 ^{99m}Tc (tricine) (TPPTS) (cyclo{Arg-Gly-Asp-D-Nal-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid)});

15 ^{99m}Tc (tricine) (TPPTS) ([2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid]-Glu(cyclo{Lys-Arg-Gly-Asp-D-Nal})-cyclo{Lys-Arg-Gly-Asp-D-Nal});

20 ^{99m}Tc (tricine) (TPPTS) (cyclo(Arg-Gly-Asp-D-Tyr((N-[5-[carbonyl]-2-pyridinyl]diazenido)-18-amino-14-aza-4,7,10-oxy-15-oxo-octadecoyl)-3-aminopropyl)-Val));

25 ^{99m}Tc (tricine) (TPPTS) (N-[5-[carbonyl]-2-pyridinyl]diazenido)-Glu(O-cyclo(Lys-Arg-Gly-Asp-D-Phe))-O-cyclo(Lys-Arg-Gly-Asp-D-Phe));

30 ^{99m}Tc (tricine) (TPPTS) (N-[5-[carbonyl]-2-pyridinyl]diazenido)-Glu(O-cyclo(D-Tyr(3-aminopropyl)-Val-Arg-Gly-Asp))-O-cyclo(D-Tyr(3-aminopropyl)-Val-Arg-Gly-Asp));

35 ^{99m}Tc (tricine) (TPPTS) (cyclo{D-Lys([2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid])-D-Phe-D-Asp-Gly-Arg});

^{99m}Tc (tricine) (TPPTS) ([2-[[5-[carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic acid)-

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Glu(cyclo{D-Lys-D-Phe-D-Asp-Gly-Arg})-cyclo{D-Lys-D-Phe-
D-Asp-Gly-Arg});

5 ^{99m}Tc (tricine)(TPPTS)(cyclo{D-Phe-D-Lys([2-[[5-[carbonyl]-2-
pyridinyl]hydrazone]methyl]-benzenesulfonic acid])-D-Asp-
Gly-Arg});

10 ^{99m}Tc (tricine)(TPPTS)(cyclo(N-Me-Arg-Gly-Asp-ATA-D-Lys(N-[5-[
carbonyl]-2-pyridinyl]diazenido)));
15 ^{99m}Tc (tricine)(TPPTS)(cyclo{Cit-Gly-Asp-D-Phe-Lys([2-[[5-[
carbonyl]-2-pyridinyl]hydrazone]methyl]-benzenesulfonic
acid)}); and,

17. A composition according to Claim 13, wherein the
radioisotope is ^{111}In .

18. A composition according to Claim 17, wherein the
radiopharmaceutical is selected from the group:
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(DOTA- ^{111}In)-Glu(cyclo{Lys-Arg-Gly-Asp-D-Phe})-cyclo{Lys-Arg-
Gly-Asp-D-Phe};

cyclo(Arg-Gly-Asp-D-Phe-Lys(DTPA- ^{111}In)); and,
30 cyclo(Arg-Gly-Asp-D-Phe-Lys)₂(DTPA- ^{111}In).

19. A composition according to Claim 11, wherein the
35 metallopharmaceutical is a therapeutic radiopharmaceutical,
the metal is a radioisotope selected from the group: ^{186}Re ,
 ^{188}Re , ^{153}Sm , ^{166}Ho , ^{177}Lu , ^{149}Pm , ^{90}Y , ^{212}Bi , ^{103}Pd , ^{109}Pd ,
 ^{159}Gd , ^{140}La , ^{198}Au , ^{199}Au , ^{169}Yb , ^{175}Yb , ^{165}Dy , ^{166}Dy , ^{67}Cu ,

105Rh, 111Ag, and 192Ir, the targeting moiety is a peptide or a mimetic thereof and the receptor is selected from the group: EGFR, FGFR, PDGFR, Flk-1/KDR, Flt-1, Tek, Tie, neuropilin-1, endoglin, endosialin, Axl, $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_5\beta_1$, $\alpha_4\beta_1$, $\alpha_1\beta_1$, and $\alpha_2\beta_2$ and the linking group is present between the targeting moiety and chelator.

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5 cyclo(Arg-Gly-Asp-D-Phe-Lys)₂(DTPA-¹⁷⁷Lu); and,

10 cyclo(Arg-Gly-Asp-D-Tyr(N-DTPA(¹⁷⁷Lu)-3-aminopropyl)-Val).

15 25. A composition according to Claim 20, wherein the radioisotope is ⁹⁰Y.

20 26. A composition according to Claim 25, wherein the radiopharmaceutical is:

25 (DOTA-⁹⁰Y)-Glu(cyclo{Lys-Arg-Gly-Asp-D-Phe})-cyclo{Lys-Arg-
Gly-Asp-D-Phe};

30 27. A composition according to Claim 11, wherein the metallopharmaceutical is a MRI contrast agent, the metal is a paramagnetic metal ion selected from the group: Gd(III), Dy(III), Fe(III), and Mn(II), the targeting moiety is a peptide or a mimetic thereof and the receptor is selected from the group: EGFR, FGFR, PDGFR, Flk-1/KDR, Flt-1, Tek, Tie, neuropilin-1, endoglin, endosialin, Axl, $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_5\beta_1$, $\alpha_4\beta_1$, $\alpha_1\beta_1$, and $\alpha_2\beta_2$ and the linking group is present between the targeting moiety and chelator.

35 28. A composition according to Claim 27, wherein the targeting moiety is a cyclic pentapeptide and the receptor is $\alpha_v\beta_3$.

29. A composition according to Claim 28, wherein the metal ion is Gd(III).

30. A composition according to Claim 29, wherein the contrast agent is:

cyclo(Arg-Gly-Asp-D-Tyr(N-DTPA(Gd(III))-3-aminopropyl)-Val).

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31. A composition according to Claim 11, wherein the metallopharmaceutical is a X-ray contrast agent, the metal is selected from the group: Re, Sm, Ho, Lu, Pm, Y, Bi, Pd, Gd, La, Au, Au, Yb, Dy, Cu, Rh, Ag, and Ir, the targeting moiety is a cyclic pentapeptide, the receptor is $\alpha_v\beta_3$, and the linking group is present between the targeting moiety and chelator.

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32. A method of treating rheumatoid arthritis in a patient comprising: administering a therapeutic radiopharmaceutical of Claim 11 capable of localizing in new angiogenic vasculature to a patient by injection or infusion.

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33. A method of treating cancer in a patient comprising: administering to a patient in need thereof a therapeutic radiopharmaceutical of Claim 11 by injection or infusion.

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34. A method of imaging formation of new blood vessels in a patient comprising: (1) administering a diagnostic radiopharmaceutical, a MRI contrast agent, or a X-ray contrast agent of of Claim 11 to a patient by injection or infusion; (2) imaging the area of the patient wherein the desired formation of new blood vessels is located.

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35. A method of imaging cancer in a patient comprising: (1) administering a diagnostic radiopharmaceutical of Claim 12 to a patient by injection or infusion; (2) imaging the patient

using planar or SPECT gamma scintigraphy, or positron emission tomography.

5 36. A method of imaging cancer in a patient comprising:
(1) administering a MRI contrast agent of Claim 27; and (2)
imaging the patient using magnetic resonance imaging.

10 37. A method of imaging cancer in a patient comprising:
(1) administering a X-ray contrast agent of Claim 31; and (2)
imaging the patient using X-ray computed tomography.

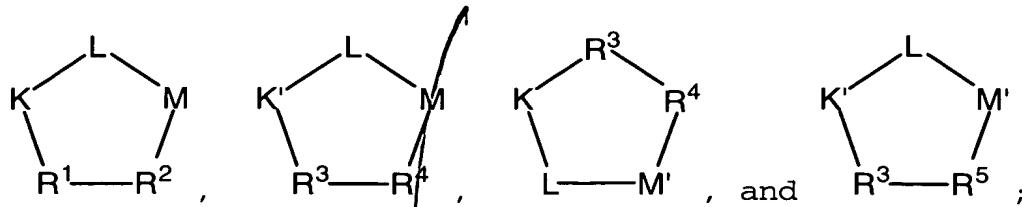
15 38. A compound, comprising: a targeting moiety and a
surfactant, wherein the targeting moiety is bound to the
surfactant, is a peptide or peptidomimetic, and binds to a
receptor that is upregulated during angiogenesis and the
compound has 0-1 linking groups between the targeting moiety
20 and surfactant.

25 39. A compound according to Claim 38, wherein the
targeting moiety is a peptide or a mimetic thereof and the
receptor is selected from the group: EGFR, FGFR, PDGFR, Flk-
1/KDR, Flt-1, Tek, Tie, neuropilin-1, endoglin, endosialin,
Axl, $\alpha_v\beta_3$, $\alpha_v\beta_5$, $\alpha_5\beta_1$, $\alpha_4\beta_1$, $\alpha_1\beta_1$, and $\alpha_2\beta_2$ and the linking
group is present between the targeting moiety and surfactant.

30 40. A compound according to Claim 39, wherein the
receptor is the integrin $\alpha_v\beta_3$ and the compound is of the
formula:

$(Q)_d-L_n-S_f$

35 wherein, Q is a cyclic pentapeptide independently selected
from the group:



K is an L-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine, δ -N-2-imidazolinylornithine, δ -N-benzylcarbamoylornithine, and β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

10 K' is a D-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine, δ -N-2-imidazolinylornithine, δ -N-benzylcarbamoylornithine, and β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

L is independently selected at each occurrence from the group: glycine, L-alanine, and D-alanine;

20 M is L-aspartic acid;

M' is D-aspartic acid;

R¹ is an amino acid substituted with 0-1 bonds to L_n,

25 independently selected at each occurrence from the group: glycine, L-valine, D-valine, alanine, leucine, isoleucine, norleucine, 2-aminobutyric acid, 2-aminohexanoic acid, tyrosine, phenylalanine, thienylalanine, phenylglycine, cyclohexylalanine, homophenylalanine, 1-naphthylalanine, lysine, serine, ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic acid, cysteine, penicillamine, and methionine;

5 R² is an amino acid, substituted with 0-1 bonds to L_n,
 independently selected at each occurrence from the group:
 glycine, valine, alanine, leucine, isoleucine,
 norleucine, 2-aminobutyric acid, 2-aminohexanoic acid,
 tyrosine, L-phenylalanine, D-phenylalanine,
 thienylalanine, phenylglycine, biphenylglycine,
 cyclohexylalanine, homophenylalanine,
 L-1-naphthylalanine, D-1-naphthylalanine, lysine, serine,
 ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic
 acid, cysteine, penicillamine, methionine, and
 2-aminothiazole-4-acetic acid;

10 R³ is an amino acid, substituted with 0-1 bonds to L_n,
 independently selected at each occurrence from the group:
 glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
 D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
 acid, D-tyrosine, D-phenylalanine, D-thienylalanine,
 D-phenylglycine, D-cyclohexylalanine,
 D-homophenylalanine, D-1-naphthylalanine, D-lysine,
 D-serine, D-ornithine, D-1,2-diaminobutyric acid,
 D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
 and D-methionine;

15 R⁴ is an amino acid, substituted with 0-1 bonds to L_n,
 independently selected at each occurrence from the group:
 glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
 D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
 acid, D-tyrosine, D-phenylalanine, D-thienylalanine,
 D-phenylglycine, D-cyclohexylalanine,
 D-homophenylalanine, D-1-naphthylalanine, D-lysine,
 D-serine, D-ornithine, D-1,2-diaminobutyric acid,
 D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
 D-methionine, and 2-aminothiazole-4-acetic acid;

20 R⁵ is an amino acid, substituted with 0-1 bonds to L_n,
 independently selected at each occurrence from the group:
 glycine, L-valine, L-alanine, L-leucine, L-isoleucine,
 L-norleucine, L-2-aminobutyric acid, L-2-aminohexanoic

acid, L-tyrosine, L-phenylalanine, L-thienylalanine, L-phenylglycine, L-cyclohexylalanine, L-homophenylalanine, L-1-naphthylalanine, L-lysine, L-serine, L-ornithine, L-1,2-diaminobutyric acid, 5 L-1,2-diaminopropionic acid, L-cysteine, L-penicillamine, L-methionine, and 2-aminothiazole-4-acetic acid;

provided that one of R¹, R², R³, R⁴, and R⁵ in each Q is substituted with a bond to L_n, further provided that when 10 R² is 2-aminothiazole-4-acetic acid, K is N-methylarginine, further provided that when R⁴ is 2-aminothiazole-4-acetic acid, K and K' are N-methylarginine, and still further provided that when R⁵ is 2-aminothiazole-4-acetic acid, K' is N-methylarginine; 15

d is selected from 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

S_f is a surfactant which is a lipid or a compound of the formula: A⁹-E¹-A¹⁰;

20 A⁹ is selected from the group: OH and OR²⁷;

A¹⁰ is OR²⁷;

25 R²⁷ is C(=O)C₁₋₂₀ alkyl;

E¹ is C₁₋₁₀ alkylene substituted with 1-3 R²⁸;

30 R²⁸ is independently selected at each occurrence from the group: R³⁰, -PO₃H-R³⁰, =O, -CO₂R²⁹, -C(=O)R²⁹, -C(=O)N(R²⁹)₂, -CH₂OR²⁹, -OR²⁹, -N(R²⁹)₂, C_{1-C5} alkyl, and C_{2-C4} alkenyl;

35 R²⁹ is independently selected at each occurrence from the group: R³⁰, H, C_{1-C6} alkyl, phenyl, benzyl, and trifluoromethyl;

R³⁰ is a bond to L_n;

L_n is a linking group having the formula:

5 (CR⁶R⁷)_g-(W)_h-(CR^{6a}R^{7a})_{g'}-(Z)_k-(W)_{h'}-(CR⁸R⁹)_{g''}-(W)_{h''}-(CR^{8a}R^{9a})_{g'''}

W is independently selected at each occurrence from the group:

O, S, NH, NHC(=O), C(=O)NH, C(=O)O, OC(=O),
NHC(=S)NH, NHC(=O)NH, SO₂, (OCH₂CH₂)₂₀₋₂₀₀, (CH₂CH₂O)₂₀₋
10 (OCH₂CH₂CH₂)₂₀₋₂₀₀, (CH₂CH₂CH₂O)₂₀₋₂₀₀, and (aa)_{t'};

aa is independently at each occurrence an amino acid;

15 Z is selected from the group: aryl substituted with 0-3 R¹⁰,

C₃-10 cycloalkyl substituted with 0-3 R¹⁰, and a 5-10
membered heterocyclic ring system containing 1-4
heteroatoms independently selected from N, S, and O and
substituted with 0-3 R¹⁰;

20 R⁶, R^{6a}, R⁷, R^{7a}, R⁸, R^{8a}, R⁹ and R^{9a} are independently selected
at each occurrence from the group: H, =O, COOH, SO₃H,
PO₃H, C₁-C₅ alkyl substituted with 0-3 R¹⁰, aryl
substituted with 0-3 R¹⁰, benzyl substituted with 0-3
R¹⁰, and C₁-C₅ alkoxy substituted with 0-3 R¹⁰,
25 NHC(=O)R¹¹, C(=O)NHR¹¹, NHC(=O)NHR¹¹, NHR¹¹, R¹¹, and a
bond to S_f;

30 R¹⁰ is independently selected at each occurrence from the
group: a bond to S_f, COOR¹¹, OH, NHR¹¹, SO₃H, PO₃H, aryl
substituted with 0-3 R¹¹, C₁-5 alkyl substituted with 0-1
R¹², C₁-5 alkoxy substituted with 0-1 R¹², and a 5-10
membered heterocyclic ring system containing 1-4
heteroatoms independently selected from N, S, and O and
substituted with 0-3 R¹¹;

35 R¹¹ is independently selected at each occurrence from the
group: H, aryl substituted with 0-1 R¹², a 5-10 membered
heterocyclic ring system containing 1-4 heteroatoms

independently selected from N, S, and O and substituted with 0-1 R¹², C₃₋₁₀ cycloalkyl substituted with 0-1 R¹², amino acid substituted with 0-1 R¹², and a bond to S_f;

5 R¹² is a bond to S_f;

k is selected from 0, 1, and 2;

h is selected from 0, 1, and 2;

h' is selected from 0, 1, 2, 3, 4, and 5;

10 h'' is selected from 0, 1, 2, 3, 4, and 5;

g is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

g' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

g'' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

g''' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

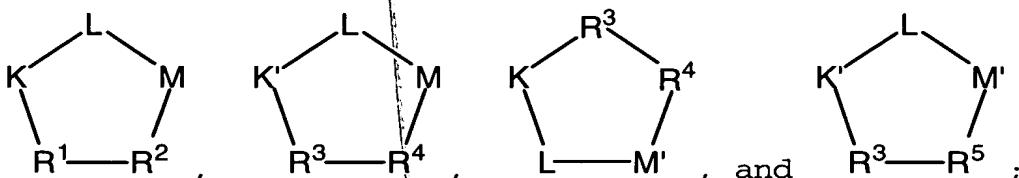
15 t' is selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10;

and a pharmaceutically acceptable salt thereof.

20 41. A compound according to Claim 40, wherein the compound is of the formula:



25 wherein, Q is a cyclic pentapeptide independently selected from the group:



30 K is an L-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine, δ -N-2-imidazolinylornithine, δ -N-benzylcarbamoylornithine, and β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

K' is a D-amino acid independently selected at each occurrence from the group: arginine, citrulline, N-methylarginine, lysine, homolysine, 2-aminoethylcysteine, δ -N-2-imidazolinylornithine, δ -N-benzylcarbamoylornithine, and β -2-benzimidazolylacetyl-1,2-diaminopropionic acid;

5 L is independently selected at each occurrence from the group: glycine, L-alanine, and D-alanine;

10 M is L-aspartic acid;

M' is D-aspartic acid;

15 R¹ is an amino acid substituted with 0-1 bonds to L_n, independently selected at each occurrence from the group: glycine, L-valine, D-valine, alanine, leucine, isoleucine, norleucine, 2-aminobutyric acid, 2-aminohexanoic acid, tyrosine, phenylalanine, 20 thienylalanine, phenylglycine, cyclohexylalanine, homophenylalanine, 1-naphthylalanine, lysine, serine, ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic acid, cysteine, penicillamine, and methionine;

25 R² is an amino acid, substituted with 0-1 bonds to L_n, independently selected at each occurrence from the group: glycine, valine, alanine, leucine, isoleucine, norleucine, 2-aminobutyric acid, 2-aminohexanoic acid, tyrosine, L-phenylalanine, D-phenylalanine, 30 thienylalanine, phenylglycine, biphenylglycine, cyclohexylalanine, homophenylalanine, L-1-naphthylalanine, D-1-naphthylalanine, lysine, serine, ornithine, 1,2-diaminobutyric acid, 1,2-diaminopropionic acid, cysteine, penicillamine, methionine, and 35 2-aminothiazole-4-acetic acid;

R³ is an amino acid, substituted with 0-1 bonds to L_n, independently selected at each occurrence from the group:

glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
acid, D-tyrosine, D-phenylalanine, D-thienylalanine,
D-phenylglycine, D-cyclohexylalanine,
5 D-homophenylalanine, D-1-naphthylalanine, D-lysine,
D-serine, D-ornithine, D-1,2-diaminobutyric acid,
D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
and D-methionine;

10 R^4 is an amino acid, substituted with 0-1 bonds to L_n ,
independently selected at each occurrence from the group:
glycine, D-valine, D-alanine, D-leucine, D-isoleucine,
D-norleucine, D-2-aminobutyric acid, D-2-aminohexanoic
acid, D-tyrosine, D-phenylalanine, D-thienylalanine,
15 D-phenylglycine, D-cyclohexylalanine,
D-homophenylalanine, D-1-naphthylalanine, D-lysine,
D-serine, D-ornithine, D-1,2-diaminobutyric acid,
D-1,2-diaminopropionic acid, D-cysteine, D-penicillamine,
D-methionine, and 2-aminothiazole-4-acetic acid;
20 R^5 is an amino acid, substituted with 0-1 bonds to L_n ,
independently selected at each occurrence from the group:
glycine, L-valine, L-alanine, L-leucine, L-isoleucine,
L-norleucine, L-2-aminobutyric acid, L-2-aminohexanoic
acid, L-tyrosine, L-phenylalanine, L-thienylalanine,
25 L-phenylglycine, L-cyclohexylalanine,
L-homophenylalanine, L-1-naphthylalanine, L-lysine,
L-serine, L-ornithine, L-1,2-diaminobutyric acid,
L-1,2-diaminopropionic acid, L-cysteine, L-penicillamine,
30 L-methionine, and 2-aminothiazole-4-acetic acid;

provided that one of R^1 , R^2 , R^3 , R^4 , and R^5 in each Q is
substituted with a bond to L_n , further provided that when
 R^2 is 2-aminothiazole-4-acetic acid, K is
35 N-methylarginine, further provided that when R^4 is
2-aminothiazole-4-acetic acid, K and K' are
N-methylarginine, and still further provided that when R^5
is 2-aminothiazole-4-acetic acid, K' is N-methylarginine;

S_f is a surfactant which is a lipid or a compound of the

formula: $A^9-E^1-A^{10}$;

5 A⁹ is OR²⁷;

A^{10} is OR^{27} ;

R²⁷ is C(=O)C₁₋₁₅ alkyl;

E¹ is C₁₋₄ alkylene substituted with 1-3 R²⁸;

R²⁸ is independently selected at each occurrence from the group: R³⁰, -PO₃H-R³⁰, =O, -CO₂R²⁹, -C(=O)R²⁹, -CH₂OR²⁹, -OR²⁹, and C₁-C₅ alkyl;

R²⁹ is independently selected at each occurrence from the group: R³⁰, H, C₁-C₆ alkyl, phenyl, and benzyl;

20 R^{30} is a bond to L_n ;

L_n is a linking group having the formula:

$$(CR^6R^7)_{g-}(W)_{h-}(CR^6aR^7a)_{g'}-(Z)_k-(W)_{h'}-(CR^8R^9)_{g''-}(W)_{h''-}(CR^8aR^9a)_{g''-}$$

25 W is independently selected at each occurrence from the group:
O, S, NH, NHC(=O), C(=O)NH, C(=O), C(=O)O, OC(=O),
NHC(=S)NH, NHC(=O)NH, SO₂, (OCH₂CH₂)₂₀₋₂₀₀, (CH₂CH₂O)₂₀₋₂₀₀, (OCH₂CH₂CH₂)₂₀₋₂₀₀, (CH₂CH₂CH₂O)₂₀₋₂₀₀, and (aa)_t;

30

Z is selected from the group: aryl substituted with 0-3 R¹⁰, C₃₋₁₀ cycloalkyl substituted with 0-3 R¹⁰, and a 5-10 membered heterocyclic ring system containing 1-4 heteroatoms independently selected from N, S, and O and substituted with 0-3 R¹⁰.

R⁶, R^{6a}, R⁷, R^{7a}, R⁸, R^{8a}, R⁹ and R^{9a} are independently selected at each occurrence from the group: H, =O, C₁-C₅ alkyl substituted with 0-3 R¹⁰, and C₁-C₅ alkoxy substituted with 0-3 R¹⁰, and a bond to S_f;

R¹⁰ is independently selected at each occurrence from the group: a bond to S_f, COOR¹¹, OH, NHR¹¹, C₁-C₅ alkyl substituted with 0-1 R¹², and C₁-C₅ alkoxy substituted with 0-1 R¹²;

R¹¹ is independently selected at each occurrence from the group: H, aryl substituted with 0-1 R¹², C₃-C₁₀ cycloalkyl substituted with 0-1 R¹², amino acid substituted with 0-1 R¹², and a bond to S_f;

R¹² is a bond to S_f;

k is selected from 0, 1, and 2;
h is selected from 0, 1, and 2;

h' is selected from 0, 1, 2, 3, 4, and 5;

h'' is selected from 0, 1, 2, 3, 4, and 5;

g is selected from 0, 1, 2, 3, 4, and 5;

g' is selected from 0, 1, 2, 3, 4, and 5;

g'' is selected from 0, 1, 2, 3, 4, and 5;

g''' is selected from 0, 1, 2, 3, 4, and 5;

s is selected from 0, 1, 2, 3, 4, and 5;

s' is selected from 0, 1, 2, 3, 4, and 5;

s'' is selected from 0, 1, 2, 3, 4, and 5;

t is selected from 0, 1, 2, 3, 4, and 5;

t' is selected from 0, 1, 2, 3, 4, and 5;

and a pharmaceutically acceptable salt thereof.

35

42. A compound according to Claim 41, wherein the present invention provides a compound selected from the group:

1-(1,2-Dipalmitoyl-sn-glycero-3-phosphoethanolamino)-12-
(cyclo(Arg-Gly-Asp-D-Phe-Lys))-dodecane-1,12-dione;
1-(1,2-Dipalmitoyl-sn-glycero-3-phosphoethanolamino)-12-((ω -
5 amino-PEG₃₄₀₀- α -carbonyl)-cyclo(Arg-Gly-Asp-D-Phe-Lys))-
dodecane-1,12-dione; and,
1-(1,2-Dipalmitoyl-sn-glycero-3-phosphoethanolamino)-12-((ω -
10 amino-PEG₃₄₀₀- α -carbonyl)-Glu-(cyclo(Arg-Gly-Asp-D-Phe-
Lys))₂)-Dodecane-1,12-dione.

43. An ultrasound contrast agent composition,
comprising:

15 (a) a compound of Claim 40, comprising: a cyclic
pentapeptide that binds to the integrin $\alpha_v\beta_3$, a surfactant and
a linking group between the cyclicpentapeptide and the
surfactant;
20 (b) a parenterally acceptable carrier; and,
(c) an echogenic gas.

44. An ultrasound contrast agent composition, further
comprising: 1,2-dipalmitoyl-sn-glycero-3-phosphatidic acid,
25 1,2-dipalmitoyl-sn-glycero-3-phosphatidylcholine, and N-
(methoxypolyethylene glycol 5000 carbamoyl)-1,2-dipalmitoyl-
sn-glycero-3-phosphatidylethanolamine.

30 45. An ultrasound contrast agent composition, wherein,
the echogenic gas is a C₂₋₅ perfluorocarbon.

46. A method of imaging cancer in a patient comprising:
35 (1) administering, by injection or infusion, a ultrasound
contrast agent composition of Claim 40 to a patient; and (2)
imaging the patient using sonography.

47. A method of imaging formation of new blood vessels in a patient comprising: (1) administering, by injection or infusion, an ultrasound contrast agent composition of of Claim 5 40 to a patient; (2) imaging the area of the patient wherein the desired formation of new blood vessels is located.

48. A therapeutic radiopharmaceutical composition, 10 comprising:

- (a) a therapeutic radiopharmaceutical of Claim 11; and,
- (b) a parenterally acceptable carrier.

49. A diagnostic radiopharmaceutical composition, 15 comprising:

- (a) a diagnostic radiopharmaceutical, a MRI contrast agent, or a X-ray contrast agent of Claim 11; and,
- (b) a parenterally acceptable carrier.

50. A therapeutic radiopharmaceutical composition, 20 comprising: a radiolabelled targeting moiety, wherein the targeting moiety is a compound Q of Claim 3 and the radiolabel 25 is a therapeutic isotope selected from the group: ^{35}S , ^{32}P , ^{125}I , ^{131}I , and ^{211}At .

51. A therapeutic radiopharmaceutical composition, 30 comprising: a radiolabelled targeting moiety, wherein the targeting moiety is a compound Q of Claim 5 and the radiolabel is a therapeutic isotope which is ^{131}I .